Class IX Session 2023-24
Subject - Mathematics
Sample Question Paper - 1

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

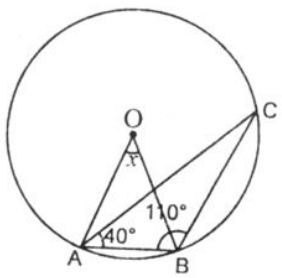
1. The point (0, -4) lies **[1]**

   a) on the negative direction of y-axis
   b) in quadrant III
   c) in quadrant IV
   d) on the negative direction of x-axis

2. Each side of an equilateral triangle is 2x cm. If $x\sqrt{3} = \sqrt{48}$, then area of the triangle is : **[1]**

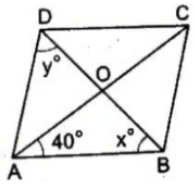
   a) $\sqrt{48}$ cm^2
   b) $48\sqrt{3}$ cm^2
   c) $16\sqrt{3}$ cm^2
   d) 16 cm^2

3. In the given figure, O is the centre of the circle. If $\angle CAB = 40^o$ and $\angle CBA = 110^o$, the value of x is : **[1]**



   a) 55^o
   b) 80^o
   c) 50^o
   d) 60^o

4. In the given figure, ABCD is a Rhombus. Find the value of x and y ? **[1]**



a) x = 55°and y = 65°

b) x = 80°and y = 80°

c) x = 75°and y = 55°

d) x = 50°and y = 50°

5. If $4^x - 4^{x-1} = 24$, then $(2x)^x$ equals **[1]**

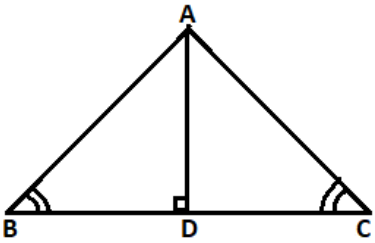
a) $\sqrt{5}$

b) $25\sqrt{5}$

c) 125

d) $5\sqrt{5}$

6. In the adjoining figure, ∠B = ∠C and AD⊥BC. The rule by which $\triangle ABD \cong \triangle ADC$ **[1]**



a) SSS

b) SAS

c) RHS

d) AAS

7. How many lines pass through one point? **[1]**

a) one

b) three

c) two

d) many

8. The degree of the zero polynomial is **[1]**

a) 0

b) any natural number

c) 1

d) not defined

9. The simplest rationalisation factor of $(2\sqrt{2} - \sqrt{3})$ is **[1]**

a) $\sqrt{2} + \sqrt{3}$

b) $2\sqrt{2} + \sqrt{3}$

c) $2\sqrt{2} + 3$

d) $\sqrt{2} - \sqrt{3}$

10. The Diagonals AC and BD of a Parallelogram ABCD intersect each other at point O. If $\angle DAC = 32^\circ$ and $\angle AOB = 70^\circ$, then $\angle DBC$ is equal to **[1]**

a) 86°

b) 38°

c) 32°

d) 24°

11. If $x^{-2} = 64$, then $x^{\frac{1}{3}} + x^0 =$ **[1]**

a) $\frac{2}{3}$

b) 3

c) $\frac{3}{2}$

d) 2

12. The linear equation 2x – 5y = 7 has **[1]**

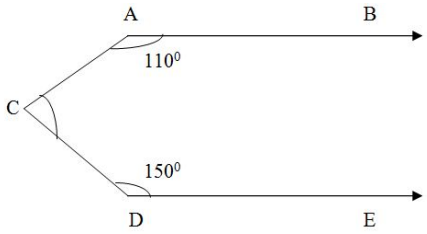
a) No solution

b) Infinitely many solutions

c) A unique solution

d) Two solutions

13. In the adjoining figure, if AB $\parallel$ DE, then the measure of $\angle ACD$ is :- **[1]**



a) 90° b) 100^0

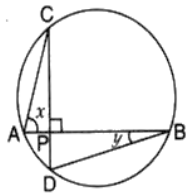
c) 80° d) 70°

14. The value of $(32)^{\frac{1}{5}} + (-7)^0 + (64)^{\frac{1}{2}}$ is **[1]**

a) 10 b) 0

c) 11 d) 1

15. In the given figure, if chords AB and CD of the circle intersect each other at right angles, then, x + y = **[1]**



a) 75^o b) 45^o

c) 90^o d) 60^o

16. Abscissa of all points on the x-axis is **[1]**

a) -1 b) 0

c) 1 d) any number

17. Express y in terms of x in the equation 5x - 2y = 7. **[1]**

a) $y = \frac{5x-7}{2}$ b) $y = \frac{7-5x}{2}$

c) $y = \frac{7x+5}{2}$ d) $y = \frac{5x+7}{2}$

18. If p(x) = 5x - $4x^2$ + 3 then p(-1) = ? **[1]**

a) -2 b) -6

c) 2 d) 6

19. **Assertion (A):** ABCD is a square. AC and BD intersect at O. The measure of $\angle AOB = 90^o$. **[1]**

Reason (R): Diagonals of a square bisect each other at right angles.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

20. **Assertion (A):** $\sqrt{3}$ is an irrational number. **[1]**

Reason (R): Square root of a positive integer which is not a perfect square is an irrational number.

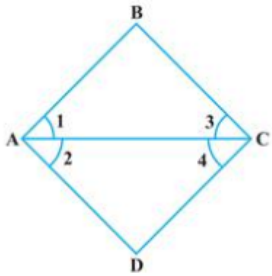
a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. In the given figure, we have $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$. Show that $\angle A = \angle C$. **[2]**



22. Read the following two statements which are taken as axioms: **[2]**

i. If two lines intersect each other, then the vertically opposite angles are not equal.

ii. If a ray stands on a line, then the sum of two adjacent angles so formed is equal to 180°.

Is this system of axioms consistent? Justify your answer.

23. Which of the following points lie on the y-axis? **[2]**

A(1, 1), B(3, 0), C(0, 3), D(0, 0), E(–5, 0), F(0, –1), G(9, 0), H(0, –8).

24. Simplify: $(\sqrt{3} - \sqrt{2})^2$ **[2]**

OR

Find the value of a : $\frac{6}{3\sqrt{2}-2\sqrt{3}} = 3\sqrt{2} - a\sqrt{3}$

25. The height of a conical vessel is 3.5 cm. If its capacity is 3.3 litres of milk. Find the diameter of its base. **[2]**

OR

The radius and slant height of a cone are in the ratio 4 : 7. If its curved surface area is 792 cm^2, find its radius. (Use $\pi = \frac{22}{7}$).

Section C

26. Simplify: $\frac{\sqrt{25}}{\sqrt[3]{64}} + \left(\frac{256}{625}\right)^{-1/4} + \frac{1}{\left(\frac{64}{125}\right)^{2/3}}$ **[3]**

27. Various modes of transport used by 1850 students of a school are given below: **[3]**

School bus	Private bus	Bicycle	Rickshaw	By foot
640	360	490	210	150

Draw a bar graph to represent the above data.

28. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersects AC at D. Then prove that, **[3]**

i. D is the midpoint AC

ii. MD is perpendicular to AC

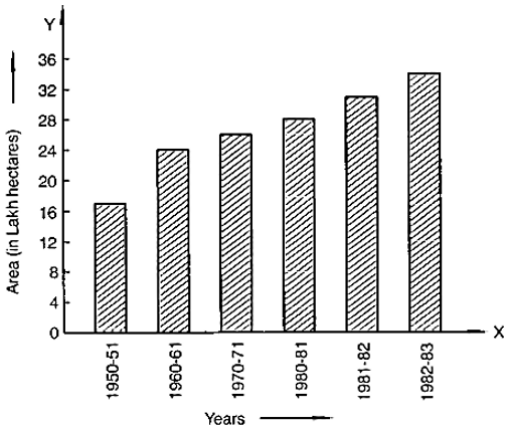
iii. CM = AM = $\frac{1}{2}$ AB

29. Find the solution of the linear equation x + 2y = 8 which represents a point on **[3]**

i. The x-axis

ii. The y-axis

30. Read the bar graph given in Figure and answer the following questions: **[3]**



i. What information is given by the bar graph?

ii. In which years the areas under the sugarcane crop were the maximum and the minimum?

iii. State whether true or false:

The area under the sugarcane crop in the year 1982-83 is three times that of the year 1950-51.

OR

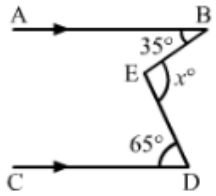
Construct a histogram for the following data:

Monthly School fee (in ₹):	30-60	60-90	90-120	120-150	150-180	180-210	210-240
No of Schools	5	12	14	18	10	9	4

31. If $x + 2a$ is a factor of $x^5 - 4a^2x^3 + 2x + 2a + 3$, find a. **[3]**

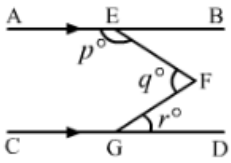
Section D

32. In each of the figures given below, AB || CD. Find the value of x° in each case. **[5]**



OR

In the given figure, AB || CD. Prove that p + q - r = 180.



33. A cloth having an area of 165 m^2 is shaped into the form of a conical tent of radius 5 m. **[5]**

i. How many students can sit in the tent if a student on an average, occupies $\frac{5}{7}$ m^2 on the ground?

ii. Find the volume of the cone.

34. The perimeter of a triangular field is 420 m and its sides are in the ratio 6 : 7 : 8. Find the area of the triangular field. **[5]**

OR

The sides of a triangle are in the ratio 5 : 12 : 13 and its perimeter is 150 m. Find the area of the triangle.

35. Using factor theorem, factorize the polynomial: $2x^4 – 7x^3 – 13x^2 + 63x – 45$ **[5]**

Section E

36. **Read the text carefully and answer the questions:** **[4]**

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon. Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).

Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total was found 120.

Reeta just entered in the class, she did not know any number.

The teacher said Reeta to form the 1st equation with two variables x and y.

Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.

Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

(i) What are the equation formed by Reeta and Veena?

(ii) What was the equation formed by Veena?

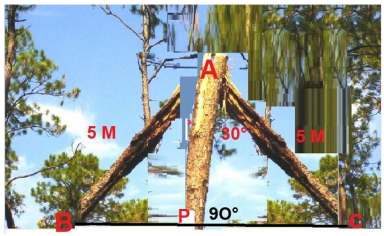
(iii) Which number did Peter think?

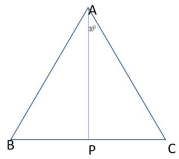
OR

Which number did Kelvin think?

37. **Read the text carefully and answer the questions:** **[4]**

In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.





(i) Show that △ACP and △ABP are congruent.

(ii) Find the value of ∠ACP?

(iii) Find the value of ∠BAP?

OR

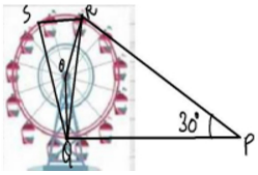
What is the total height of the tree?

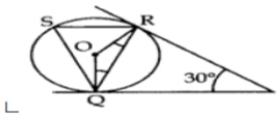
38. **Read the text carefully and answer the questions:** **[4]**

A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms

the figure as given below





(i) Find ∠ROQ.

(ii) Find ∠RQP.

(iii) Find ∠RSQ.

OR

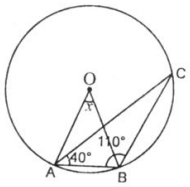
Find ∠ORP.

Solution

Section A

1. **(a)** on the negative direction of y-axis
   Explanation: Since x = 0 so point lies on y-axis, but value of y is -ve.
   So, point lies on -ve direction of y-axis.

2. **(c)** $16\sqrt{3}$ cm^2
   Explanation: Here , $x\sqrt{3} = \sqrt{48}$
   $\Rightarrow$ x = $\sqrt{16}$
   Side = 2x
   Area of equilateral triangle = $\frac{\sqrt{3}}{4}(\text{Side})^2$
   = $\frac{\sqrt{3}}{4}(2x)^2$
   = $\sqrt{3}x^2$ sq. cm
   = $\sqrt{3}\left(\sqrt{16}\right)^2 = 16\sqrt{3}$

3. **(d)** 60^o
   Explanation: 

   In $\triangle$ABC
   $\angle$A + $\angle$B + $\angle$C = 180o
   $\Rightarrow$ $\angle$C = 180^o - 40^o - 110 = 30^o
   Since AB is a chord and angle made by a chord at the centre is twice the angle made by it on any point on the circumference, therefore:-
   $x = 2 \times 30^0 = 60^0$

4. **(d)** x = 50°and y = 50°
   Explanation: ABCD is a rhombus and a rhombus is also a parallelogram. A rhombus has four equal sides.
   The diagonals of a rhombus are perpendicular bisector of each other.
   So, in $\triangle$AOB, $\angle$OAB = 40°, $\angle$AOB = 90 °and $\angle$ABO = 180°- (40° + 90°) = 50 °
   $\therefore$ x = 50°
   In $\triangle$ABD, AB = AD
   So, $\angle$ABD = $\angle$ADB = 50°
   Hence, x = 50° and y = 50°

5. **(b)** $25\sqrt{5}$
   Explanation: $4^x - 4^{x-1} = 24$
   $\Rightarrow 4^x - \frac{4^x}{4^1} = 24$
   $\Rightarrow 4^x\left(1 - \frac{1}{4}\right) = 24$
   $\Rightarrow 4^x\left(\frac{3}{4}\right) = 24$
   $\Rightarrow 4^x = \frac{24\times4}{3}$
   $\Rightarrow 4^x = 32$
   $\Rightarrow (2^2)^x = (2)^5$

$\Rightarrow 2^{2x} = 2^5$

Comparing, we get

$2x = 5 \Rightarrow x = \frac{5}{2}$

$\therefore (2x)^x \left(2 \times \frac{5}{2}\right)^{\frac{5}{2}} = (5)^{\frac{5}{2}}$

$= \sqrt{5^5} = \sqrt{5 \times 5 \times 5 \times 5 \times 5}$

$= 5 \times 5\sqrt{5} = 25\sqrt{5}$

6.

(d) AAS

Explanation: In △ABD and △ADC, we have

∠ABD = ∠ACD (given)

∠BDA = ∠CDA (90^o)

AD = AD (common in both)

Hence, $\triangle ABD \cong \triangle ADC$, by AAS criterion

7.

(d) many

Explanation: Because one point can be solution of many equations. So many equations can be pass from one point.

8.

(d) not defined

Explanation: The general form of a polynomial is a_nx^n, where n is a natural number.

For zero polynomial $a_n = 0$.

Since the largest value of n for which a_n is non-zero is negative infinity (all the integers are bigger than negative infinity).

Therefore, the degree of zero polynomials is not defined.

9.

(b) $2\sqrt{2} + \sqrt{3}$

Explanation: $2\sqrt{2} + \sqrt{3}$

10.

(b) 38°

Explanation: ∠DAC = ∠ACB = 32^o (alternate angles)

∠AOB + ∠COB = 180^o (linear pair)

∠COB = 180 - 70^o = 110^o

In triangle BOC,

∠BOC + ∠OCB + ∠CBO = 180^o (angle sum property)

110^o + 32 ^{o}+ ∠CBO = 180^o

∠CBO = 180^o - 142^o = 38^o

11.

(c) $\frac{3}{2}$

Explanation: $x^{-2} = 64$

$\Rightarrow x^{-2} = 8^2$

$\Rightarrow \left(\frac{1}{x}\right)^2 = (8)^2$

$\therefore \frac{1}{x} = 8 \Rightarrow x = \frac{1}{8}$

$x^{\frac{1}{3}} + x^0 = \left(\frac{1}{8}\right)^{\frac{1}{3}} + 1$

$= \left[\left(\frac{1}{2}\right)^3\right]^{\frac{1}{3}} + 1 = \left(\frac{1}{2}\right)^{3 \times \frac{1}{3}} + 1$

$= \frac{1}{2} + 1 = \frac{3}{2}$

12.

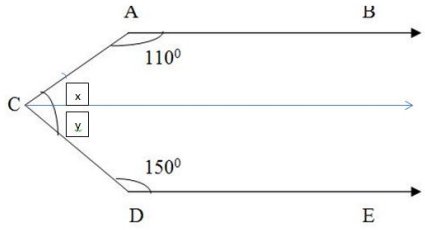
(b) Infinitely many solutions

Explanation: Given equation is 2x - 5y = 7

There is no given value of x and y so we can take any values.
For every value of x, we get a corresponding value of y and vice-versa.
Therefore, it has infinitely many solutions.

13.

(b) 100^0

Explanation: 

x + 110° = 180° (Supplimentary angles)
x = 70°
y + 150° = 180° (Supplimentary angles)
y = 30°
∠ACD = 70° + 30° = 100°

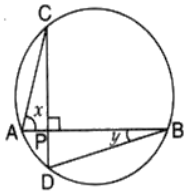
14.

(c) 11

Explanation: $(32)^{\frac{1}{5}} + (-7)^0 + (64)^{\frac{1}{2}}$
= 2 + 1 + 8
= 11

15.

(c) 90^o

Explanation: 

$y = \angle ACP$ (Angles of same arc)
$\angle APC = 180^0 - 90^0 = 90^0$ ($\angle APC, \angle CPB$ are linear pair)
Thus from triangle APC,
$x + y + \angle APC = 180^0$
Hence, $x + y = 90^0$

16.

(d) any number

Explanation: Abscissa of point in x axis is can be any number but ordinate will always be zero, because for any point to lie on x-axis its y-ordinate must be equal to zero.

17. **(a)** $y = \frac{5x-7}{2}$

Explanation: 5x - 2y = 7
- 2y = 7 - 5x
2y = 5x - 7
y = $\frac{5x-7}{2}$

18.

(b) -6

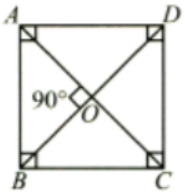
Explanation: $p(x) = 5x - 4x^2 + 3$
Putting x = -1 in p(x), we get
$p(-1) = 5 \times (-1) - 4 \times (-1)^2 + 3 = - 5 - 4 + 3 = -6$

19. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Since, diagonals of a square bisect each other at right angles.

$\angle AOB = 90^o$



20. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: Both A and R are true and R is the correct explanation of A.

Section B

21. We have $\angle 1 = \angle 3$ …(1) [Given]

And $\angle 2 = \angle 4$ …(2) [Given]

Now, by Euclid's axiom 2, we have if equal are added to equals, the whole are equal.

Adding (1) and (2), we get

$\angle 1 + \angle 2 = \angle 3 + \angle 4$

Hence, $\angle \mathrm{A} = \angle \mathrm{C}$.

22. It is known that, if two lines intersect each other, then the vertically opposite angles are equal. It is a theorem, therefore,given Statement I is false and not an axiom.

Also, we know that, if a ray stands on a line, then the sum of two adjacent angles so formed is equal to 180°. It is an axiom.

Therefore, given statement parallel is true and an axiom.

Thus, in given statements, first is false and second is an axiom. Therefore, given system of axioms is not consistent.

23. A point lies on y-axis if x-coordinate is zero. Hence C, D, F and H points lie on y-axis.

24. $(\sqrt{3} - \sqrt{2})^2 = (\sqrt{3})^2 + (\sqrt{2})^2 - 2(\sqrt{3})(\sqrt{2})$

$= 3 + 2 - 2\sqrt{3 \times 2} = 5 - 2\sqrt{6}$

OR

$3\sqrt{2} - a\sqrt{3}$

$= \frac{6}{3\sqrt{2}-2\sqrt{3}}$

$= \frac{6}{3\sqrt{2}-2\sqrt{3}} \times \frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$

$= \frac{6(3\sqrt{2}+2\sqrt{3})}{(3\sqrt{2})^2-(2\sqrt{3})^2}$

$= \frac{6(3\sqrt{2}+2\sqrt{3})}{18-12}$

$= \frac{6(3\sqrt{2}+2\sqrt{3})}{6}$

$= 3\sqrt{2} + 2\sqrt{3}$

On comparing,

$3\sqrt{2} - a\sqrt{3} = 3\sqrt{2} + 2\sqrt{3}$

$\Rightarrow$ a = -2

25. We are given that,

Height of a conical vessel = 3.5 cm and

Capacity of conical vessel is 3.3 litres or 3300 cm^3

Now,

We know, Volume of cone $= \frac{1}{3}\pi r^2 h$

$3300 = \frac{1}{3} \times \frac{22}{7} \times r^2 \times 3.5$

or $r^2 = 900$

or r = 30

So, radius of cone is 30 cm

Hence, diameter of its base = 2 radius

$= 2 \times 30$

= 60 cm

OR

Let the radius of cone $(r) = 4x\ cm$ and the slant height of the cone $(l) = 7x\ cm$

Curved surface area of cone $= \pi rl$

$\therefore \pi rl = 792cm^2$

$\Rightarrow \frac{22}{7} \times 4x \times 7x = 792$

$\Rightarrow x^2 = \frac{792}{22 \times 4} = 9$

$\Rightarrow x = 3cm$

$\therefore$ Radius of the cone $= 4 \times 3 = 12cm$

Section C

26. Given, $\frac{\sqrt{25}}{\sqrt[3]{64}} + \left(\frac{256}{625}\right)^{-1/4} + \frac{1}{\left(\frac{64}{125}\right)^{2/3}}$

$= \frac{\sqrt{5 \times 5}}{\sqrt[3]{4 \times 4 \times 4}} + \left(\frac{625}{256}\right)^{1/4} + \left(\frac{125}{64}\right)^{2/3}$

$= \frac{5}{4} + \left(\frac{5^4}{4^4}\right)^{1/4} + \left(\frac{5^3}{4^3}\right)^{2/3}$

$= \frac{5}{4} + \left(\frac{5}{4}\right)^{4 \times \frac{1}{4}} + \left(\frac{5}{4}\right)^{3 \times \frac{2}{3}}$

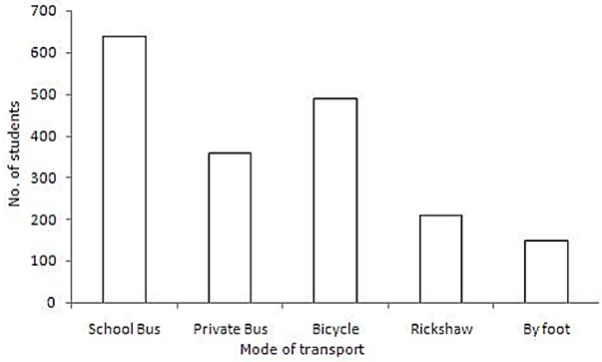
$= \frac{5}{4} + \frac{5}{4} + \left(\frac{5}{4}\right)^2 = \frac{5}{4} + \frac{5}{4} + \frac{25}{16}$

$= \frac{20+20+25}{16} = \frac{65}{16}$

27. Take themode of transport along the x-axis and the number of students along the y-axis.

Along the y-axis, take 1 big division = 100 units.

Now we shall draw the bar chart, as shown below:

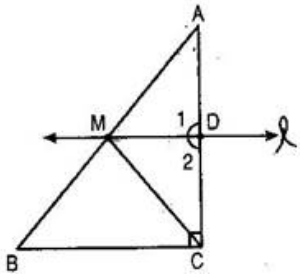


28. i. In $\triangle$ABC, M is the mid-point of AB[Given]

MD $\parallel$ BC

$\therefore$ AD = DC[Converse of mid-point theorem]

Thus D is the mid-point of AC.



ii. $l \parallel$BC (given) consider AC as a transversal.

$\therefore \angle 1 = \angle C$ [Corresponding angles]

$\Rightarrow \angle 1 = 90^\circ$ [$\angle C = 90^\circ$]

Thus MD $\perp$AC.

iii. In $\triangle$AMD and $\triangle$CMD,

AD = DC[proved above]

$\angle 1 = \angle 2 = 90^\circ$ [proved above]

MD = MD[common]

$\therefore \triangle AMD \cong \triangle CMD$ [By SAS congruency]

$\Rightarrow$ AM = CM[By C.P.C.T.].....(i)

Given that M is the mid-point of AB.

$\therefore$AM = $\frac{1}{2}$ AB.....(ii)

From eq. (i) and (ii),

CM = AM = $\frac{1}{2}$ AB

29. i. On x-axis y = 0

$\Rightarrow x + 2 \times 0 = 8 \Rightarrow x = 8$

Therefore, the required point is (8, 0).

ii. On y-axis x = 0

$\Rightarrow 0 + 2y = 8$

$\Rightarrow y = \frac{8}{2} \Rightarrow y = 4$

Thus, the required point is (0, 4).

30. i. It gives the information about the areas (in lakh hectors) under sugarcane crop during different years in India.

ii. The areas under the sugarcane crops were the maximum and minimum in 1982-83 and 1950-51 respectively.

iii. The area under sugarcane crop in the year 1982-83= 34 lakh hectares.

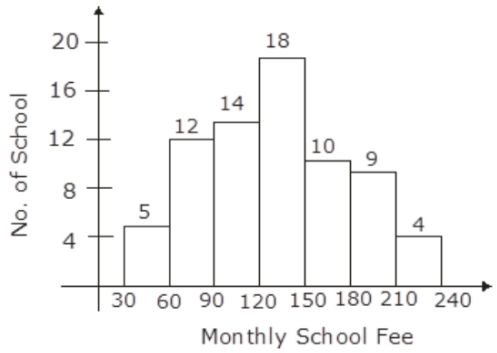
The area under sugarcane crop in the year 1950-51= 17 lakh hectares.

Clearly, the area under sugarcane crop in the year 1982-83 is not 3 times that of the year 1950-51

So, the given statement is false.

OR

REQUIRED GRAPH



31. Let p(x) = $x^5 - 4a^2x^3 + 2x + 2a + 3$

If x - (-2a) is a factor of p(x) , then p(-2a) = 0

$\therefore$ p(-2a) = $(-2a)^5 - 4a^2(-2a)^3 + 2(-2a) + 2a + 3$

$= -32a^5 + 32a^5 - 4a + 2a + 3$

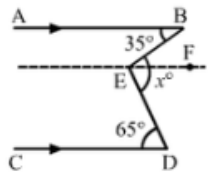
$= -2a + 3$

Now, p(-2a) = 0

$\Rightarrow$ -2a + 3 = 0

$\Rightarrow a = \frac{3}{2}$

Section D

32. 

Draw EF $\parallel$ AB $\parallel$ CD

Now, AB $\parallel$ EF and BE is the transversal.

Then,

$\angle ABE = \angle BEF$ [Alternate Interior Angles]

$\Rightarrow \angle BEF = 35^\circ$

Again, EF $\parallel$ CD and DE is the transversal

Then,

$\angle DEF = \angle FED$

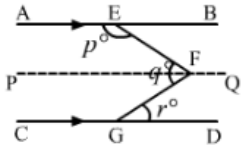
$\Rightarrow \angle FED = 65^\circ$

$\therefore x^\circ = \angle BEF + \angle FED$

$x^\circ = 35^\circ + 65^\circ$

$x^\circ = 100^\circ$

OR



Draw PFQ || AB || CD

Now, PFQ || AB and EF is the transversal.

Then,

$\angle AEF + \angle EFP = 180^\circ$ ...(i)

[Angles on the same side of a transversal line are supplementary]

Also, PFQ || CD.

$\angle PFG = \angle FGD = r^\circ$ [Alternate Angles]

and $\angle EFP = \angle EFG - \angle PFG = q^\circ - r^\circ$

putting the value of ∠EFP in equation (i)

we get,

p° + q °- r° = 180° [∠AEF = p°]

33. Suppose l be the slant height of the conical tent.

Radius of the base of conical tent $(r) = 5m$

i. Area of the circular base of the cone = $\pi r^2 = \frac{22}{7} \times 5^2 m^2$

Number of student = $\frac{Area\ of\ the\ base}{Area\ occupied\ by\ one\ student}$

$= \frac{\frac{22}{7} \times 5 \times 5m^2}{\frac{5}{7}m^2}$ = $\frac{22}{7} \times 5 \times 5 \times \frac{7}{5} = 110$

ii. Also, curved surface area of cone = πrl

$\Rightarrow 165 = \frac{22}{7} \times 5 \times l$

$\Rightarrow l = \frac{165 \times 7}{22 \times 5}$

$\Rightarrow l = \frac{21}{2}m = 10.5m$

Also, $h^2 = l^2 - r^2$

$\Rightarrow h = \sqrt{(10.5)^2 - 5^2} = \sqrt{15.5 \times 5.5} \approx$<p

Volume of conical tent = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 5^2 \times 9.23m^3 = 241.74m^3$.

34. Suppose that the sides in metres are 6x, 7x and 8x.

Now, 6x + 7x + 8x = perimeter = 420

$\Rightarrow$ 21x = 420

$\Rightarrow x = \frac{420}{21}$

$\Rightarrow$ x = 20

$\therefore$ The sides of the triangular field are $6 \times 20m, 7 \times 20m, 8 \times 20m$, i.e., 120 m, 140 m and 160 m.

Now, s = Half the perimeter of triangular field.

$= \frac{1}{2} \times 420m = 210m$

Using Heron's formula,

Area of triangular field $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{210(210-120)(210-140)(210-160)}$

$= \sqrt{210 \times 90 \times 70 \times 50}$

$= \sqrt{66150000} = 8133.265m^2$

Hence, the area of the triangular field = 8133.265 m^2.

OR

Given that the sides of a triangle are in the ratio 5: 12: 13 and its perimeter is 150 m

Let the sides of the triangle be 5x m, 12x m and 13x m.

We know:

Perimeter = Sum of all sides

or, 150 = 5x + 12x + 13x

or, 30x = 150

or, x = 5

Thus, we obtain the sides of the triangle.

$5 \times 5 = 25$ m

$12 \times 5 = 60$ m

$13 \times 5 = 65$ m

Now,

Let:

a = 25 m, b = 60 m and c = 65 m

$\therefore s = \frac{150}{2} = 75\text{m}$

$\Rightarrow$ s = 75 m

By Heron's formula, we have

Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{75(75-25)(75-60)(75-65)}$

$= \sqrt{75 \times 50 \times 15 \times 10}$

$= \sqrt{15 \times 5 \times 5 \times 10 \times 15 \times 10}$

$= 15 \times 5 \times 10$

= 750 m^2

35. Given, $f(x) = 2x^4 - 7x^3 - 13x^2 + 63x - 45$

The factors of constant term - 45 are $\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 45$

The factors of the coefficient of x^4 is 2. Hence possible rational roots of f(x) are

$\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 45, \pm 1/2, \pm 3/2, \pm 5/2, \pm 9/2, \pm 15/2, \pm 45/2$

Let, x – 1 = 0

$\Rightarrow$ x = 1

$f(1) = 2(1)^4 - 7(1)^3 - 13(1)^2 + 63(1) - 45$

= 2 – 7 – 13 + 63 – 45

= 0

Let, x – 3 = 0

$\Rightarrow$ x = 3

$f(3) = 2(3)^4 - 7(3)^3 - 13(3)^2 + 63(3) - 45$

= 162 – 189 – 117 + 189 – 45

= 0

Let x+3=0

=> x=-3

$f(-3)=2(-3)^4-7(-3)^3-13(-3)^2+63(-3)-45$

=162+189-117-189-45=0

Let 2x-5=0

=> $x=\frac{5}{2}$

$f(\frac{5}{2})=2(\frac{5}{2})^4-7(\frac{5}{2})^3-13(\frac{5}{2})^2+63(\frac{5}{2})-45$

$=\frac{625-875-650+1260-360}{2^3}$

$=\frac{1885-1885}{2^3}=0$

Therefore, (x-1),(x-3),(x+3) and (2x-5) are factors of f(x).

Since f(x) is a polynomial of degree 4, therefore it cannot have more than more factors.

Therefore, $2x^4 - 7x^3 - 13x^2 + 63x - 45 = (x - 1)(x - 3)(x + 3)(2x - 5)$

Section E

36. **Read the text carefully and answer the questions:**

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon.

Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).

Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total was found 120.

Reeta just entered in the class, she did not know any number.

The teacher said Reeta to form the 1st equation with two variables x and y.

Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.
Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

(i) x - y = 10

2x + 3y = 120

(ii) 2x + 3y = 120

(iii) x - y = 10 ...(1)

2x + 3y = 120 ...(2)

Multiply equation (1) by 3 and to equation (2)

3x - 3y + 2x + 3y = 30 + 120

$\Rightarrow$ 5x = 150

$\Rightarrow$ x = 30

Hence the number thought by Prateek is 30.

OR

We know that x - y = 10 ...(i) and 2x + 3y = 120 ...(ii)

Put x = 30 in equation (i)

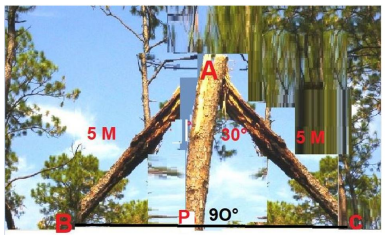
30 - y = 10

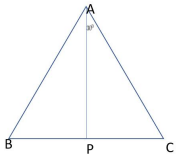
$\Rightarrow$ y = 40

Hence number thought by Kevin = 40

37. **Read the text carefully and answer the questions:**

In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.





(i) In $\triangle$ACP and $\triangle$ABP

AB = AC (Given)

AP = AP (common)

$\angle APB = \angle APC = 90^o$

By RHS criteria $\triangle ACP \cong \triangle ABP$

(ii) In $\triangle$ACP

$\angle APC + \angle PAC + \angle ACP = 180^o$

$\Rightarrow 90^o + 30^o + \angle ACP = 180^o$ (angle sum property of $\triangle$)

$\Rightarrow \angle ACP = 180^o - 120^o = 60^o$

$\angle ACP = 60^o$

(iii) $\triangle ACP \cong \triangle ABP$

Corresponding part of congruent triangle

$\angle BAP = \angle CAP$

$\angle BAP = 30^o$ (given $\angle CAP = 30^o$)

OR

$\triangle ACP$

$AC^2 = AP^2 + PC^2$

$\Rightarrow 25 = AP^2 + 16$

$\Rightarrow AP^2 = 25 - 16 = 9$

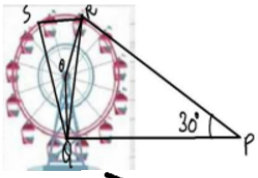
$\Rightarrow AP = 3$

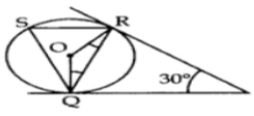
Total height of the tree = AP + 5 = 3 + 5 = 8 m

38. **Read the text carefully and answer the questions:**

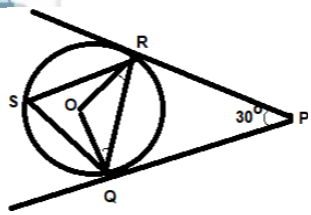
A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms the figure as given below





(i)

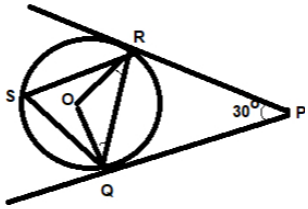


$\angle ROQ + \angle RPQ = 180^o$

$\angle ROQ + 30^o = 180^o$

$\angle ROQ = 150^o$

(ii)

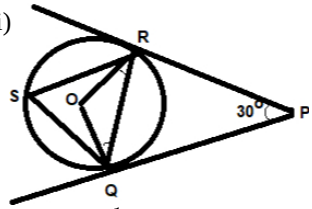


$\angle RQP = \angle OQP - \angle OQR$

$= 90^o - 15^o$

$= 75^o$

(iii)

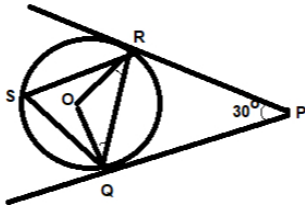


$\angle RSQ = \frac{1}{2} \angle ROQ$

$= \frac{1}{2} \times 150^o$

$\angle RSQ = 75^o$

OR



$\angle ORP = 90^o$

$\because$ radius and tangent are $\perp$ at point of contact